

## THE INVENTION CLAIMED IS:

1. Method of making a gas matrix composite ultrasound transducer comprising the steps of:

- a) forming a first structure by aligning piezoelectric rods or fibers substantially parallel to each other on an adhesive side of a first curable adhesive-faced sheet;
- b) placing a second sheet with adhesive on both sides over the first structure so as to provide a gap between the rods or fibers;
- c) aligning piezoelectric rods or fibers on a second sheet substantially parallel to the rod or fibers of the first structure;
- d) repeating steps b) and c) a plurality of times to build a second structure so as to maintain the air gaps between the rods or fibers;
- e) curing the adhesive in the second structure;
- f) cutting the cured second structure perpendicular to the rods or fibers into narrow slices to form third structures; and
- g) applying a conductive layer to each face of a third structure to form electrical contacts with both ends of the rods or fibers.

2. Method of making a gas matrix piezoelectric actuator comprising the steps of:

- a) forming a first structure by aligning piezoelectric rods or fibers substantially parallel to each other on an adhesive side of a first curable adhesive-faced sheet;
- b) placing a second sheet with adhesive on both sides over the first structure so as to provide a gap between the rods or fibers;
- c) placing a third sheet with an alternating electrode pattern printed thereon over the second sheet so as to maintain the air gaps;
- d) placing a fourth sheet with adhesive on both sides over the third sheet;
- e) repeating steps b) to d) a plurality of times to form a third structure so as to maintain the air gaps; and
- d) applying a DC electric field so that the rods or fibers are polarized.

3. The method according to claims 1 or 2, wherein the first and second sheets have substrates of compressed fibers.

4. The method according to claims 1 or 2, wherein the first and second sheets have substrates of paper or cardboard.

5. The method according to claims 1 or 2, wherein the first and second sheets have substrates of NOMEX paper.

6. The method according to claims 1 or 2, wherein the gap formed between the rods or fibers is an air gap.